ISRAT JAHAN

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Research Summary

My PhD thesis focuses on the evolution of developmental constraints in aggregative multicellularity and symbiosis in the social amoebae *Dictyostelium discoideum*. I use a combination of lab experiments, agent-based models, comparative genomics, phylotranscriptomics, and statistical modeling to broadly answer how genetic conflicts, or their resolution, drive the evolution of novel adaptations.

Education

Doctor of Philosophy in Evolution, Ecology and Population Biology — Expected 2024
Advisor: Joan E. Strassmann, Ph.D. and David C. Queller, Ph.D.
Washington University in St. Louis

Master of Science in Biotechnology — 2018
Indian Institute of Technology, Bombay

Bachelor of Science in Biochemistry with Honors — 2016
University of Delhi

Additional Learning:

Math Crash Course, Imaging Science Student Council, WUSTL — 2024
- Summer asynchronous course focusing on Linear Algebra and Calculus

Janelia Evolution of Multicellularity Workshop, HHMI — 2021
- Two-day online workshop focusing on the mechanisms and selective pressures driving the transition from unicellular to multicellular life
- Covered tools like single cell -omics, cell atlas, and conceptual approaches to understand multicellular regulation

Data Carpentry Workshop on Genomics, American Naturalists Graduate Council — 2020
- Two-day workshop on genomic analysis of Next Generation Sequencing data
- Covered data wrangling and processing, quality control, alignment, variant calling

Interdisciplinary Study of Cooperation Winter School, ASU — 2020
- Lectures, seminars, and tutorials on fundamental processes underlying cooperation across diverse systems and disciplines
- Presented poster on Evolution of multicellularity in *Dictyostelium discoideum*

Invited Talks

- Hong Kong University of Science and Technology — 2023
  Evolution of Multicellularity: Many routes, one destination
- Paradox of the Organism (revisited) Conference — 2022
  Revisiting the "egg problem" in the evolution of multicellularity
- Daulat Ram College, University of Delhi — 2022
  Evolution of Aggregative Multicellularity
- Harris Stowe State University — 2021
  Maintaining a cooperative group: Lessons from the social amoeba D. discoideum.

Awards, Honors, and Fellowships

W.D. Hamilton Award for Outstanding Graduate Student Presentation, SSE May 2023
- **Finalist ($500)**

3-minute Thesis competition, WUSTL April 2023
- First place winner and People's choice award

McDonnell International Scholars Academy
- **Funding for Ph.D. for 5 years ($143,000**) 2018 – 2023
- Travel Allowance **($10,000**)
- Selected as **Bayer Sponsored Fellow**

Evolution Conference Registration Fee Waiver 2022

Student Travel Grant, ASU Interdisciplinary Study of Cooperation Winter School 2020

M.Sc. Fellowship (**INR 80000**) awarded by Department of Biotechnology, Govt. of India 2016 – 2018

All round Best Student of Daulat Ram College, University of Delhi 2015

Publications

- **Jahan, I.**, Scott, T.J., Strassmann, J.E., and Queller, D.C. Testing the coordination hypothesis: incompatibilities in the absence of a single-cell bottleneck in an experimentally evolved social amoeba. Preprint. ***bioRxiv*** (https://doi.org/10.1101/2024.05.12.593719). **Under Review at Evolution Letters**.
- Larsen, T.J., **Jahan, I.,** Brock, D.A., Strassmann, J.E. and Queller, D.C., 2023. Reduced social function in experimentally evolved Dictyostelium discoideum implies selection for social conflict in nature. *Proceedings of the Royal Society B*, *290*(2013), p.20231722.
- **Jahan, I.** Larsen, T.J., Strassmann, J.E., and Queller, D.C. Group Maintenance in Aggregative Multicellularity, In: The evolution of multicellularity, eds. Herron, M.D., Conlin, P.L. and Ratcliff, W.C. CRC Press, 2022.

Manuscripts under preparation:
- **Jahan, I.,** Larsen, T.J., Strassmann, J.E., and Queller, D.C. Symbiont history explains phenotypic trait evolution under relaxed selection in host *Dictyostelium discoideum*.
- **Jahan, I.**, Scott, T.J., Strassmann, J.E., and Queller, D.C. Genomic phylostratigraphy shows early transcriptome conservation in the social amoeba.
- **Jahan, I.**, Scott, T.J., Strassmann, J.E., and Queller, D.C. Novel kin selected genes have increased pleiotropy in *Dictyostelium discoideum.*
- **Jahan, I.**, P.M. Shreenidhi, Stephenson, C.J., Strassmann J.E., Queller, D.C. Pathogenic bacteria in the *Burkholderia* genus encode more social genes (SOCs) than host-beneficial species.

Service

Peer-reviewer for PloS Computational Biology 2024 - Present

Center for Diversity and Inclusion (WUSTL) 2021 – 2022
Graduate Student Member of the Advisory Board

Steering Committee of Evolution, Ecology and Population Biology Program 2019 – 2021
Graduate Student representative

Research Experience

Member of "Paradox of the Organism" Working Group 2022
Invited by Arvid Ågren, Ph.D., and Manus Patten, Ph.D., to participate in a Templeton Foundation funded working group on the "Paradox of the organism".

Graduate Research
- **Evolution of aggregative multicellularity in *Dictyostelium discoidium*** **Present**
  PhD Thesis under Joan Strassmann, Ph.D., and David Queller, Ph.D.
  Department of Biology, Washington University in St. Louis

- **Adaptation and bet hedging in yeast under fluctuating selection** Fall 2018
  Rotation Project with Carlos Botero, Ph.D.
  Department of Biology, Washington University in St. Louis
  Performed fitness assays for experimentally evolved yeast populations
- **Molecular fossils from Pescadero Basin hydrothermal system** Fall 2018
  Rotation Project with Alex Bradley, Ph.D.,
  Department of Earth and Planetary Sciences, WUSTL
  Extracted lipids hydrocarbons from carbonate samples to study early life

M.Sc. Thesis

Biological and evolutionary study of different pathways taken by the proteins of the relict plastid apicoplast in apicomplexan parasite *Toxoplasma gondii* 2017 – 2018
Advisor: Swati Patankar, Ph.D. Department of Biosciences and Bioengineering, IIT Bombay

Using techniques of tissue culture (HFF cells), molecular cloning and confocal microscopy, I showed that the apicoplast membrane protein APT1 does not take an evolutionarily conserved golgi dependent pathway in *Toxoplasma gondii*.

Undergraduate Research

- Hands on training in **Drosophila Resource Centre** 2015 – 2016
  Project: Elucidation of dosage compensation over generations in the fruit fly, *Drosophila melanogaster*.
- Innovation Project on Biomarkers of Heat Stress and Acclimatization 2014 – 2015
  Project: Biochemical and physiological changes in heat stress and acclimation
  DU Journal of Undergraduate Research, Vol 1, Issue 3, p49-56, 2015

Teaching Experience and Training

Behavioral Ecology (BIO 472) 2019
Mentored Teaching Experience (TA), Washington University in St. Louis

- Assistant to Instructor (Prof. Joan Strassmann) for 34 students
- Lead Discussion section for 13 students

Professional Development in Teaching Certification 2019 – 2024
Centre for Teaching and Learning, Washington University in St. Louis

- **STEM Pedagogy workshops**
  Introduction to Pedagogical Scholarship
  Writing assignments in STEM
- **Foundations in Teaching Workshops**
  Teaching in an American Classroom
  Asking Questions to Improve Learning
- **Foundations in Digital Pedagogy**
  Designing and Delivering a Guest Lecture

Mentorship

Peer mentor for incoming graduate Students 2021 – 2022
Undergraduate Students

- Kiersten Anderson, Strassmann-Queller Lab, Washington University Spring 2023
- Maya Pillai, Strassmann-Queller Lab, Washington University Summer 2023
- Sara Lichtarge, DBBS Summer Research Program Summer 2022
- Kayla Wallace, Strassmann-Queller Lab, Washington University Spring 2021

Science Outreach

Science at the Ferguson Farmers Market

Prepared short activities to teach basic evolution and ecology concepts to a general audience at a farmers' market booth — 2019 – 2024

Neurodiversity and Allyship Seminar — 2021

- Panelist for seminar by Neurodiversity at the Workplace
- Organized a training session with the help of Biology Inclusion Committee with 60 attendees across the departments of Biology, Chemistry, Physics, Earth & Planetary Sciences, Math & Statistics, and the Academy for Diversity, Equity, & Inclusion

OUT of the margins: A safe space discussion on sexuality and gender in nature — 2021

- Organized a workshop with Dr. Anwesha Kundu
- Facilitated a discussion session with 20 International Scholars across the departments of Biomedical Sciences, Engineering, Law, Social Work, Economics, English, Political Science

Young Scientist Program, WUSTL

- Director of Finance — 2019
  Served on the executive board and managed funds and grants for YSP finance
- Continuing Mentor — 2018 – 2019
  Mentored two high school students at Soldan International High School, St. Louis

Programming Tools

R, Github, NetLogo, Command-Line (BASH)

References

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Dr. David Queller
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Additional references available upon request